

Notice of Allowability	Application No.	Applicant(s)	
	10/081,396	YOO, SUNG-JOO BEN	
	Examiner	Art Unit	
	Daniel E Valencia	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed August 18, 2003.
2. ☒ The allowed claim(s) is/are 1-10, 24-27 and 29-36.
3. ☒ The drawings filed on 22 February 2002 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
- * Certified copies not received: _____.
5. ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 - (a) ☐ The translation of the foreign language provisional application has been received.
6. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

7. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
8. ☐ CORRECTED DRAWINGS must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No. _____.
 - (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the Examiner.
 - (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet.

9. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|---|
| 1 <input type="checkbox"/> Notice of References Cited (PTO-892) | 2 <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3 <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 4 <input type="checkbox"/> Interview Summary (PTO-413), Paper No. _____ |
| 5 <input checked="" type="checkbox"/> Information Disclosure Statements (PTO-1449), Paper No. <u>0803</u> | 6 <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 7 <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material | 8 <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9 <input type="checkbox"/> Other |

DETAILED ACTION

Applicant's communication filed on August 18, 2003 has been carefully studied by the Examiner. The arguments advanced therein, considered together with the amendments made to the claims, are persuasive and the rejections based upon prior art made of record in the previous Office Action are withdrawn. The 35 U.S.C. § 112 problem identified in the previous Office Action has also been obviated. In accordance with the communication filed, claims 1-7, 24, 25, 27, and 29 have been amended, claims 11-23 and 28 have been cancelled, and new claims 30-36 have been acknowledged. All of applicant's claims are now allowable.

Examiner's Amendment

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone message from Charles Guenzer received on September 25, 2003. The amendment to claim 35 corrects the improper claim dependency.

The application has been amended as follows:

In the claims:

Claim 35. (Currently Amended) The optical switching device of Claim 34, wherein said at least one second substrate includes a plurality of second substrates electrically contacted to respective ones of said opto-electronic portions.

Allowable Subject Matter

Claims 1-10, 24-27, and 29-36 are allowed.

The following is an examiner's statement of reasons for allowance: As to claim 1, the prior art alone or in combination fails to disclose or render obvious an integrated optical switching device, comprising: a substrate; a plurality K of first arrayed waveguide gratings formed in said substrate and configured as optical demultiplexers each including at least one first input and W first outputs; a plurality K of second arrayed waveguide gratings formed in said substrate and configured as optical multiplexers each including at least W second inputs and one second output; a third arrayed waveguide grating formed in said substrate and having WK third inputs and WK third outputs; a plurality WK of first wavelength converters at least partially formed in said substrate between respective ones of said first outputs and said third inputs and converting a wavelength of a first optical input signal while maintaining it in optical form; and a plurality WK of second wavelength converters at least partially formed in said substrate between respective ones of said third outputs and said second inputs

and converting a wavelength of a second optical input signal while maintaining it in optical form.

For example, Tsuyama discloses an optical switch, but lacks the arrangement of WK outputs and inputs to the first and second pluralities of AWGs, respectively, connected to WK the third AWG (see fig 9). Additionally, Tsuyama does not disclose that the wavelength is converted while maintaining the signal in optical form. Finally, Tsuyama does not disclose all the claimed components (including the wavelength converters) formed on the *same* substrate.

Doerr discloses an optical switch with a similar topology (fig. 13); however, the reference does not disclose or suggest that the components 1304 and 1305 are wavelength converters. The wavelength converters are a critical part of the claimed invention. Doerr also fails to disclose or suggest that all components are integrated on the same substrate.

With regards to the Nakajima reference, the present invention is distinct for several reasons. First, Nakajima does not disclose AWGs for demultiplexing (fig 48) and the first plurality of wavelength converters. Rather, Nakajima's "Branching portion" stage simply splits the optical signal into equal portions. Second, Nakajima does not disclose a third AWG for routing the signals from the wavelength converters. Instead, Nakajima's router uses a cross connect switch with an actuation assembly for routing the signals. Finally, Nakajima does not disclose all elements formed on the substrate.

All three references cited in the previous Office Action have substantial deficiencies. Although all three disclose optical switches, one of ordinary skill in the art would not have any motivation to combine the three. Further, combining one reference with another would ultimately destroy the functionality of the switches disclosed in the three references.

Independent claim 8 remains allowable in view of a recent search update. For reasons for allowance, see previous Office Action (page 9, paragraph 1).

Regarding independent claim 24, the prior art alone or in combination fails to disclose or render obvious an optical router, comprising: a plurality of K arrayed waveguide gratings arranged in sectors in a first substrate and wavelength selectively connecting a respective first input to a plurality of respective first output ports; a plurality K opto-electronic circuitries arranged in said sectors each receiving optical inputs from said first output ports of respective one of said first arrayed waveguide gratings and including at least one control electrode; a second arrayed waveguide grating receiving optical inputs from all of said opto-electronic circuitries; and a plurality of electronic control circuitries formed in respective second substrates bonded to said first substrate within respective ones of said sectors and connected to respective ones of said control electrodes. None of the prior art, including Tsuyama, discloses, "...a *plurality of electronic control circuitries formed in respective second substrates bonded to*

said first substrate". Rather, the prior art teaches control circuitry disposed on the same substrate as the optical components.

Like claim 1, independent claims 27 and 32 requires the first and second pluralities of AWGs, the third AWG, the two pluralities of wavelength converters, with the same arrangement, wherein all formed in the same substrate. The only limitation not present in claims 27 and 32 is the maintenance of the optical signal in optical form during wavelength conversion. Claims 27 and 32 are patentably distinct for the same reasons mentioned above in the discussion of claim 1.

As to independent claim 34, the prior art alone or in combination fails to disclose or render obvious an integrated optical switching device, comprising: a first substrate including an InP base and having formed therein a plurality of first arrayed waveguide grating, a plurality of second arrayed waveguide gratings, a third arrayed waveguide array grating disposed physically and operatively between (1) said first array waveguide gratings and (2) said second array waveguide gratings, and a plurality of opto-electronic portions disposed physically and operatively between said (1) third waveguide grating and (2) said first and second waveguide gratings; at least one second substrate each including GaAs base bonded to said first substrate and including first electrical circuitry contacted to said opto-electronic portions; and an integrated circuit including a silicon base bonded to said at least one second substrate and including second electrical circuitry controlling said first electrical circuitry.

Although Tsuyama, Nakajima, and Doerr all teach similar switching structures, none of the prior art teaches a first, second, and third substrate comprised of InP, GaAs, and silicon, respectively. Additionally, none of the prior art teaches electronic circuitry being formed in a different substrate than that of the arrayed waveguide gratings.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel E Valencia whose telephone number is (703)-305-4399. The examiner can normally be reached on Monday-Friday 9:30-6:00.

The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

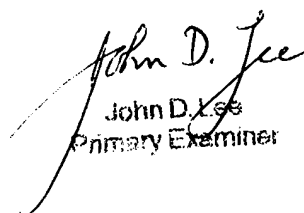
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

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John D. Lee
Primary Examiner